

State and Private Forestry  
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BIOLOGICAL EVALUATION  
WESTERN SPRUCE BUDWORM  
PAYETTE AND BOISE NATIONAL FORESTS  
1977

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## BIOLOGICAL EVALUATION

### WESTERN SPRUCE BUDWORM

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by

Jerry A. E. Knopf,<sup>1/</sup> Arland Valcarce,<sup>1/</sup> and Ron Beveridge<sup>2/</sup>

#### ABSTRACT

The 1977 aerial detection surveys showed a slight decline in defoliation on the Payette National Forest and conversely, new areas of western spruce budworm activity were found on the Boise National Forest. A total of over 725,000 acres are currently defoliated, of which 291,037 acres are in the Idaho Primitive Area. Natural control factors such as predators and parasites are not significantly affecting population reductions. Weather factors have not interfered with budworm populations significantly since 1965. Egg mass surveys indicate moderate to heavy defoliation for 1978 with increasing activity on the Boise National Forest.

#### INTRODUCTION

Western spruce budworm, a conifer feeding species, is one of the most widely distributed and destructive forest insects in western North America. This insect feeds primarily on Douglas-fir, mixed true firs, and Engelmann spruce. In some areas larch will be defoliated. In late July and early August, 1977, aerial detection flights were made to map and identify areas of light, moderate and heavy budworm defoliation on the Boise and Payette National forests. Since 1973, aerial and ground observations have revealed increasing populations of western spruce budworm on the Boise and Payette National Forests, including parts of the Idaho Primitive Area. In 1973, approximately 224,000 acres were defoliated by the budworm. Since then, the infestation has continued, and in 1977 the size and intensity of the infestation increased to 777,202 acres on both Forests, including portions of the Idaho Primitive Area. Normally, this pest exists at low levels or endemic status, held in check by natural enemies, forest stand conditions, and in some cases, by climate. Periodically, however, natural control factors cannot keep up with population development and widespread epidemics can and do occur. Knopf, 1977 a and b discusses areas of budworm activity, egg mass surveys and parasite data.

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In an effort to provide land managers with a more comprehensive understanding of western spruce budworm problems, stand impact studies that were started in 1976 were continued from July through September, 1977. Egg mass sampling, which will provide defoliation predictions for 1978, was done from mid August through September, 1977. Parasite data was taken from pupal collections made in mid July, 1977. Currently, the western spruce budworm is epidemic over large portions of the Payette and Boise National Forests. Due to the contiguous nature of these infestations, the Boise-Payette epidemic will be treated collectively.

#### HISTORICAL INFORMATION

Since first reported as epidemic in Idaho in 1922, budworm populations have reached epidemic status in the 1950's, the early 1960's and the 1970's. Historically, budworm populations in the northern Rockies generally last one to five years with extensions of six to fifteen years. Southward however, in the Intermountain Region, infestations have a tendency to persist upwards of ten years with a recurrence rate of ten to fourteen years. In Forest Service Region 4, the first large scale western budworm suppression program took place in 1955, when 837,210 acres were sprayed with DDT at one pound per acre. In 1956, 475,890 acres were treated in a similar manner. In 1957, additional acreages were sprayed, part of which encompassed the pine butterfly outbreak on the Boise National Forest. In 1963, on the Targhee National Forest and BLM lands, approximately 250,000 acres were treated and the following year, 1964, 525,070 acres were sprayed on the Salmon National Forest. In 1965, a proposed 300,000 acre project was cancelled when unseasonal spring freezes severely reduced larva populations.

Defoliation by western spruce budworm has been reported in the Intermountain Region each year since 1954 when aerial surveillance surveys began. In 1964, defoliation by western spruce budworm reached a high of 2,276,000 acres in the Intermountain Region. Infestation declined to 224,100 acres in 1973, but by 1977, 988,215 acres were defoliated. Of that total, 921,365 acres occurred in southwestern Idaho, of which 291,037 acres were in the Primitive Area.

#### GENERAL INFORMATION

INSECT: Western spruce budworm, Choristoneura occidentalis Freeman.

HOST TREES: Grand fir, Abies grandis (Dougl.) Lindl.  
Subalpine fir, Abies lasiocarpa (Hook.) Nutt.  
Douglas-fir, Pseudotsuga menziesii var. glauca  
(Beissn.) Franco  
Engelmann spruce, Picea engelmanni Parry  
Western larch, Larix occidentalis Nutt.

LOCATION: Payette National Forest: Areas west, north, east and south-east of McCall, including the south fork of the Salmon River drainage on the east, southward to and continuous with infestations on the northern end of the Boise Forest and areas north of McCall along the Main Salmon River to Riggins, Idaho.

Boise National Forest: Areas north of High Valley west and north of Sagehen Reservoir, northward along West Mountain west of Cascade, Idaho, continuing to the northern Boise Forest boundary where the infestation joins infestations on the Payette National Forest. One area north of Harris Creek Summit, another on the west side of Deadwood Reservoir, areas north and east of Packer John Mountain.

FEATURES OF THE AREA: Western spruce budworm defoliation covers land forms that range from heavily roaded to basically inaccessible. The most significantly visible portion of the infestation lays west of Cascade, Idaho, on West Mountain and to the northeast of the town of McCall along the upslopes of Brundage Mountain. The most rugged and semi-remote portion of the infestation encompasses the South Fork of the Salmon River from a point approximately five miles north of Warm Lake and extends downstream to the confluence of the South Fork and Main Salmon River. Primitive Area portions of the infestation are characterized by steep, highly dissected land forms with wide differences in elevation and are basically inaccessible except by horseback or foot travel.

#### BIOLOGICAL INFORMATION

##### AERIAL SKETCH MAP SURVEY:

During 1977, visible defoliation was observed and sketch mapped during July and August (Figure 1). On the Boise National Forest, defoliation was categorized as follows: 43,495 acres light, 42,009 acres moderate, 46,592 acres heavy, for a total of 132,096 acres. On the Payette National Forest, 46,484 acres light, 67,587 acres moderate, 235,852 acres heavy and 4,146 acres very heavy, for a total of 354,069 acres. In the Idaho Primitive Area, which comprises portions of the Payette, Challis, Boise and Salmon National Forests, 291,037 acres were observed to be visibly defoliated. Of these acreages, no light, moderate or heavy defoliation classes were assigned. The oldest and heaviest areas of defoliation on the two forests are found primarily west of McCall and along the South Fork of the Salmon River in the Krassel area where mortality to the understory and top-killing has been occurring for the past four years. These infestations have been underway since 1968. Current observations show increased top-killing on West Mountain west of Cascade Lake and also reproduction and understory trees showing heavy damage with some mortality occurring in trees three to ten feet tall. Ollieu, 1976-77, discussed impact of defoliation by western spruce budworm to stands in the Boise-Payette infestation.

Newest areas of infestation were observed in the Sagehen Reservoir area, extending, where host type occurs, toward High Valley on the Boise National Forest. In addition, considerable acreage of light budworm infestation heretofore undetected, was noted in the Packer John area and Scriber Creek drainage of the Middle Fork of the Payette River. Pine Creek infestation on the South Fork of the Payette River showed no visible defoliation and only light defoliation was observed west of Deadwood Reservoir. The infestation, primarily in subalpine fir stands north of Harris Creek Summit and the Hawley Mountain area have increased in size and intensity. At the present time, little damage has been observed in Douglas-fir stands mixed with subalpine fir type.

#### PARASITE SURVEY

Representative samples of western spruce budworm pupae were collected from 27 locations in the main infestation exclusive of the South Fork of the Salmon River. Pupae were reared individually in separate petri dishes in the lab. After parasites emerged, identifications were made and percent parasitism for each sample point was figured. Cumulative results are as follows:

<u>SAMPLE PLOTS</u>	<u>NO. PUPAE REARED</u>	<u>NO. PARASITES EMERGED*</u>	<u>PERCENT PARASITISM</u>
27	682	92	13

The mean rate of parasitism was 13 percent, which is up slightly from the 10 percent recorded in 1976. To effect any significant biological control of the western spruce budworm parasitism would have to exceed 50-70 percent. This degree of biological control has not been recorded in western spruce budworm populations. Comparatively, 70-90 percent parasitism, apart from predation, has significantly reduced populations of the pine butterfly and Douglas-fir tussock moth.

- \* The following parasites were reared from western spruce budworm pupae: Wasps, family Ichneumonidae: Itoplectis quadricingulata (Prov.), Phaeogenes hariolus (Cr.), Glypta fumiferanae (Vier.). Parasitic flies of the Tachinidae included: Actia sp., Nemorilla sp., Madremyia saundersii (Will.), Aplomya caesar (Ald.), Phryxe pecosensis Tns. and Pseudoperichaeta sp. Of these, 14 percent were Diptera and 86 percent Hymenoptera.

## EGG MASS SURVEY

In 1976, six management units were defined that covered budworm defoliation on the Boise and Payette National Forests. Egg mass samples were taken from these units and predicted defoliation held true for 1977. Interest by land managers for suppression consideration required a change in unit boundaries in 1977. Therefore, twelve biological units were established by personnel preparing a draft Environmental Impact Statement. Egg mass sampling data and predictions for defoliation in 1978 have been directed toward these twelve newly established biological units.

Thirty egg mass evaluation plots were established on the Boise Forest and 118 on the Payette Forest, for a total of 148 sampling plots. Egg mass counts were made by collecting 2 seventy centimeter mid-crown branches from opposite quadrants of 3 codominate Douglas-fir or grand fir trees per plot. Branches were carefully removed with telescopic pruners, labeled, placed in individual cloth sacks and transported to the laboratory in McCall for egg mass counts. Following is a resume of predicted defoliation for 1978.

### DEFOLIATION PREDICTIONS FOR BIOLOGICAL UNITS - 1978

<u>BIOLOGICAL UNITS</u>	<u>PREDICTED DEFOLIATION-1978</u>
1 Boulder	Mod.-Heavy
2 Main Salmon	Mod.-Heavy
3 Salmon North	Not sampled
4 Council	Mod.-Heavy
5 Cascade-McCall	Mod.-Heavy
6 South Fork-Salmon South	Mod.-Heavy
7 Johnson Creek	Not sampled
8 Sagehen	Heavy
9 Payette	Light-Mod.
10 Middle Fork Payette	Light
11 Bear Valley-Deadwood	Light
12 Idaho City	Heavy

## DISCUSSION

Aerial sketch mapping in 1977 revealed defoliation by western spruce budworm had expanded somewhat on the Boise National Forest and decreased on the Payette. Boise Forest acreage in 1977 totalled 132,096. This is an increase of 41,786 acres from 1976. On the Payette Forest, 354,069 acres were defoliated, which is a decrease of 68,331 acres since 1976. These acreages are exclusive of Primitive Area defoliation. Expansion of budworm activity was most notable on the Boise National Forest in the Packer John Mountain area and westward and southward from Sagehen Reservoir. In the Payette National Forest, decreases were noted primarily along the Main Salmon River which falls in the Main Salmon Biological Unit, however the south half of this unit, in the vicinity of Hazard Creek and toward McCall, is still supporting heavy populations of spruce budworm.

As information was gathered during the summer and fall of 1977, it became apparent that areas damaged the most from defoliation by budworm occurred in grand fir, Abies grandis habitat types. Those specific habitat types are grand fir/western goldthread; grand fir/queen cup bead lily. These very wet grand fir habitat types have experienced the heaviest damage from the western spruce budworm. Two other grand fir habitat types showing considerable budworm activity are grand fir/twin flower and grand fir/ mountain maple. Grand fir/blue huckleberry habitat types have shown only moderate levels of budworm activity.

Forest Insect and Disease Management personnel will conduct additional aerial surveillance surveys in 1978, and continue parasite surveys, egg mass surveys and stand impact surveys to provide current information to forest resource managers and to help develop management alternatives. Of the nine biological units being considered for the 1978 suppression program, all except two show moderate to heavy defoliation predictions. The two units are the Middle Fork of the Payette and the Bear Valley-Deadwood country where only light defoliation was visible and also light egg mass numbers were found.

Results from surveys indicate defoliation by the western spruce budworm has the potential to expand in acreage and increase in intensity on both the Boise and Payette National Forests in 1978. In the past, climatic factors have occasionally drastically reduced budworm populations when freezing temperatures occurred in the spring as the young larvae were migrating to the newly formed buds. In the current outbreaks, natural control of this type and magnitude has not been observed at levels which adversely affect budworm populations. The last recorded instance of this kind occurred in 1965, when a 300,000 acre budworm project was cancelled on the Salmon National Forest.

### RECOMMENDATIONS

1. Personnel on the Boise and Payette National Forests, in company with FIDM staff, should complete an Environmental Impact Statement in time for consideration of suppression as an alternative for 1978.
2. FIDM personnel should continue close aerial surveillance of defoliation by western spruce budworm populations on the Boise and Payette National Forests, also in other areas of southwest Idaho such as the Salmon and Challis National Forests where new budworm outbreaks appeared in 1977. In addition, egg mass surveys and stand impact surveys should be conducted in 1978 to provide current information on budworm infestations.
3. Because of the possibility that considerable acreage could be deleted after carefully considering the impact associated with specific habitat types, land managers should be extremely careful in proposing suppression as an alternative. In addition, long range management efforts should be directed toward (1) encouragement of non-susceptible host trees, (2) shortening rotation cycles wherever possible, (3) breaking up large areas of susceptible host type (4) encouraging management toward younger and thriftier stands.

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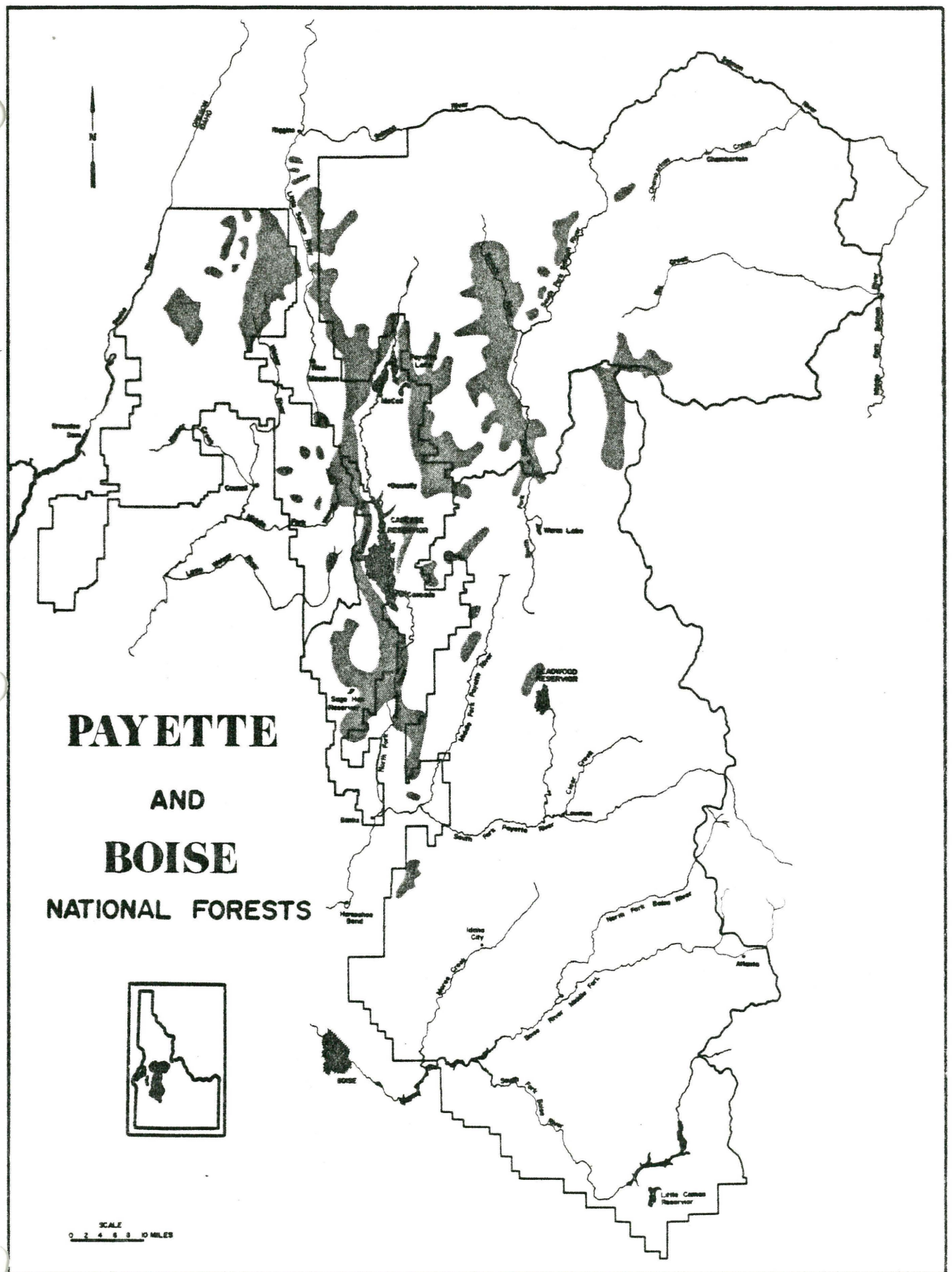


Figure 1. Area of defoliation by western spruce budworm, Boise and Payette National Forests and intermingled federal, state and private lands-1977.